

# Professional Activities January –June 2010

Norbert Schuff

# Publications

- 3 as first author

1. An MRI substudy of a donepezil clinical trial in mild cognitive impairment. In Neurobiology of Aging
2. Patterns of Altered Cortical Perfusion and Diminished Subcortical Integrity in Posttraumatic Stress Disorder: A MRI Study. In NeuroImage
3. A new sensitive MRI marker for memory deficits in normal aging. Editorial in Neurology

- 6 as last author

1. Improved pseudo-continuous arterial spin labeling for mapping brain perfusion. JMRI
2. Concordance and discordance between brain perfusion and atrophy in frontotemporal dementia. Brain Imaging Behavior
3. Joint analysis of structural and perfusion MRI for cognitive assessment and classification of Alzheimer's disease and normal aging. (NeuroImage)
4. Magnetic resonance imaging of hippocampal subfields in posttraumatic stress disorder. General Archives Psych.
5. Multivariate statistical mapping of spectroscopic imaging data. MRM
6. Poor subjective sleep quality is associated with a decreased volume of the CA3/Dentate Gyrus Hippocampal Subfield. American Psychiatric Journal.

- 16 others

# Formal Teaching

- Medical Image Informatics (taught 2 units)
- BIR (1)
- FAIR (1)
- P41 workshop (1)

# Services

1. Member CHR committee SFGH section
2. Member VA R&D committee
3. Ad-hoc member NIH Clinical Neuroscience and Neurodegeneration Study section
4. Ad-hoc member MJ Fox PD Biomarker program
5. BRC, Parkinson grant reviews
6. Participant TBI roadmap
7. 12 journal reviews

# New Grant Applications

1. Imaging Core in: 4R Tauopathy Clinical Trial Biomarker Development (PI: Adam Boxer) - will likely be funded.
2. Parkinson's Progression Markers Initiative : DTI supplement (by invitation - decision pending)
3. NIH: MRI markers of cognitive and motor deficits in Parkinson's Disease (resubmission in Oct )

# Work on Funded Projects

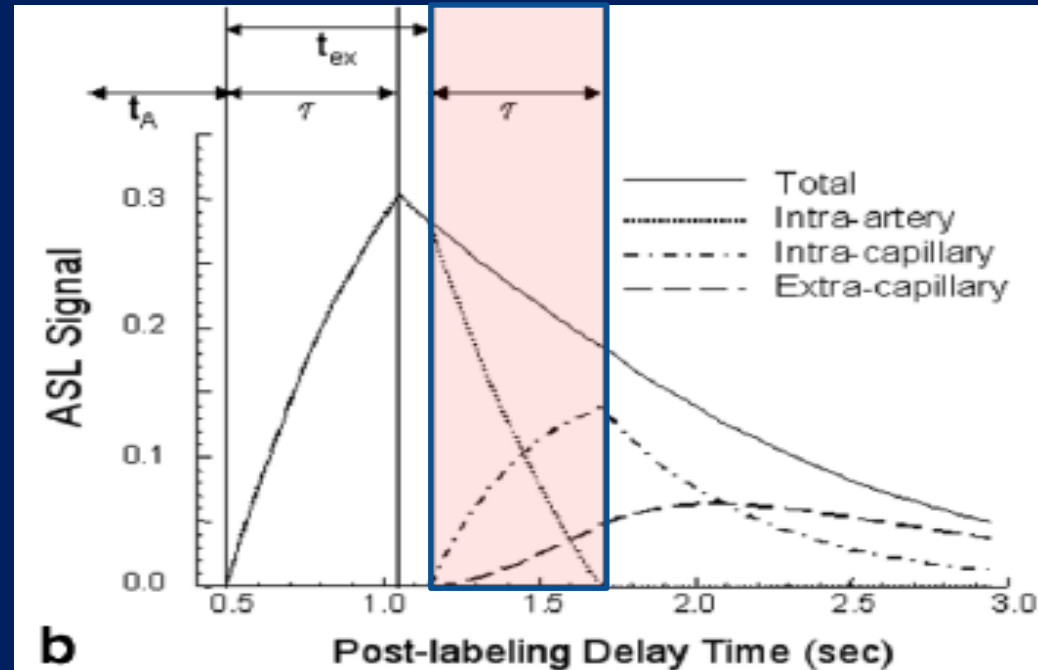
1. PD continued data analysis
2. P41
  1. Diffusion weighted MPRAGE (with Marzieh)
  2. Spiral MPRAGE (in collaboration with Guenther, Marzieh)
  3. Dynamic ASL (revival of 4 phase model, with Yinan)
3. FTLD imaging initiative (Rosen) – MRI prep completed
4. ADNI GO - prep ASL-MRI
5. Multivariate PTSD – ready to begin
6. Dynamic dual echo ASL (with Guenther, initial modeling)

# Age and Disease Effects On The Arterial-Capillary Transitional Perfusion Phase

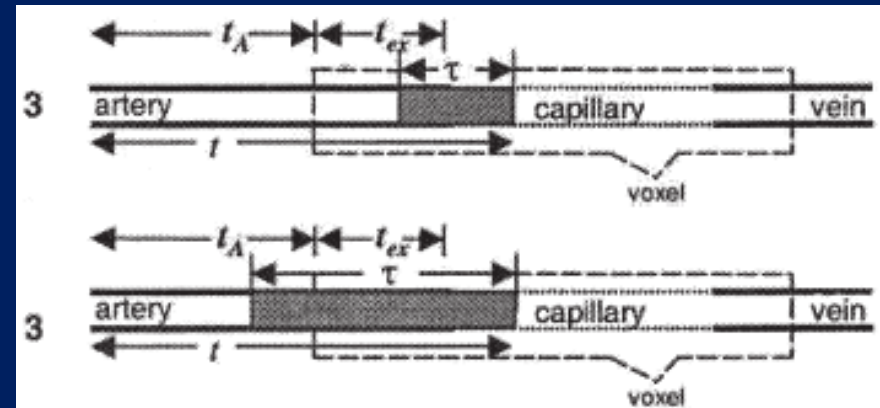
$$\Delta M_a(t) = 2\alpha M_{0a} f e^{-R_{1b}t} \min(T_{ex} + \tau - t, t_{ex}).$$

$$\Delta M_c(t) = 2\alpha M_{0a} f e^{-R_{1b}t} \int_0^t e^{-PS_v(t'-T_{ex})} dt'$$

$$\Delta M_e(t) = 2\alpha M_{0a} PS_v f \int_{t_d'}^t \int_{T_{ex}}^{t'} e^{-PS_v(t_c-T_{ex})-R_{1b}(t_c+t-t')-R_{1d}(t'-t_c)} dt_c dt',$$

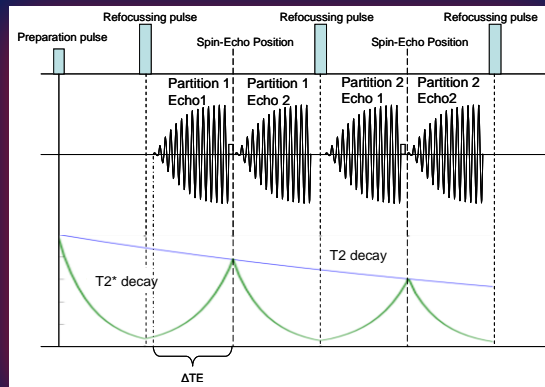


$$t = \begin{cases} 0 \rightarrow t_A & \text{transit phase} \\ t_A \rightarrow t_A + t_{ex} & \text{arterial phase} \\ t_A + t_{ex} \rightarrow t_A + t_{ex} + \tau & \text{arterial-capillary transitional phase} \\ > t_A + t_{ex} + \tau & \text{capillary phase} \end{cases}$$



# ASL Based Regional R2 and R2' Measurements

## Sequence



$$R2^* = 2 \cdot R2 + R2'$$

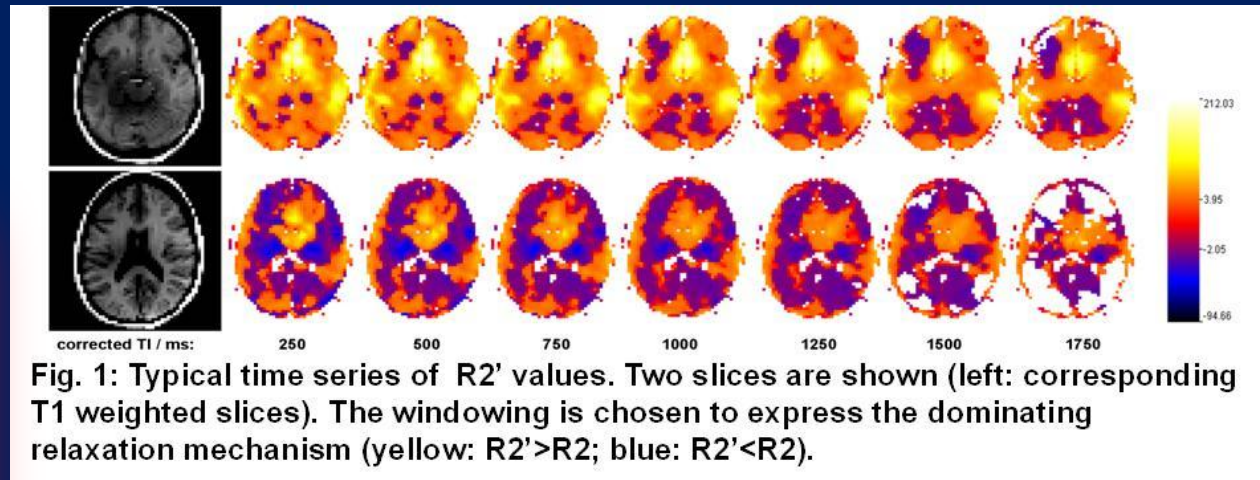


Fig. 1: Typical time series of R2' values. Two slices are shown (left: corresponding T1 weighted slices). The windowing is chosen to express the dominating relaxation mechanism (yellow: R2'>R2; blue: R2'<R2).

In collaboration with J Gregori and M. Guenther



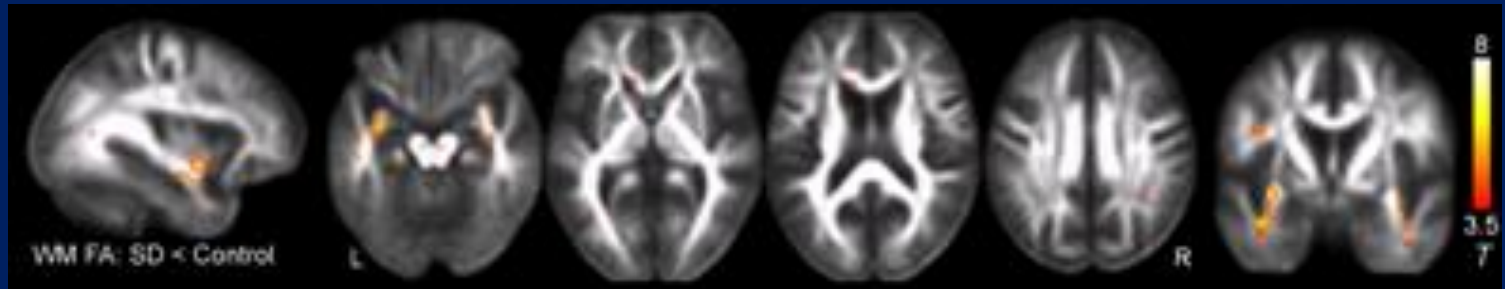
# New Explorations

1. Multivariate analysis of DTI (with Yu)
2. Nonparametric approximations
  1. using generalized additive models (GAM)
  2. using Kernel methods generalization
3. Spatial correlation graph analysis of DTI/DSI

# Univariate Analysis of DTI

## Maps of Fractional Anisotropy

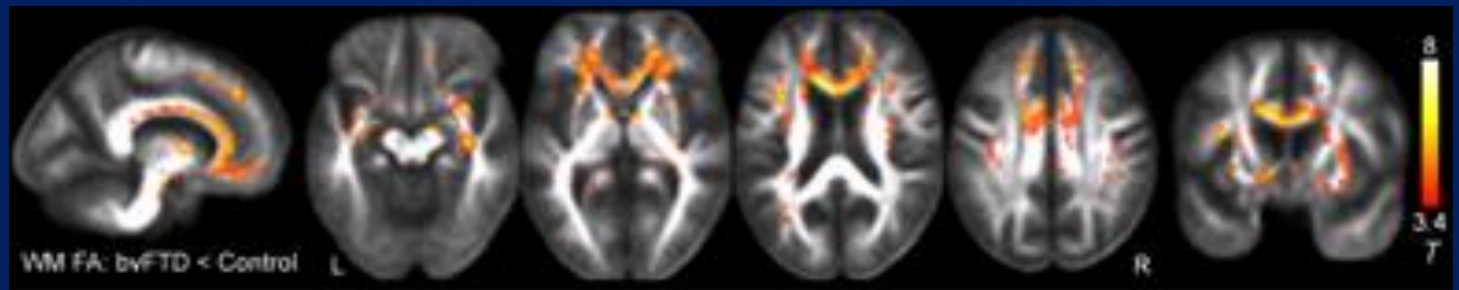
Semantic  
Dementia



Primary  
Nonfluent  
Aphasia



Frontotemporal  
Dementia

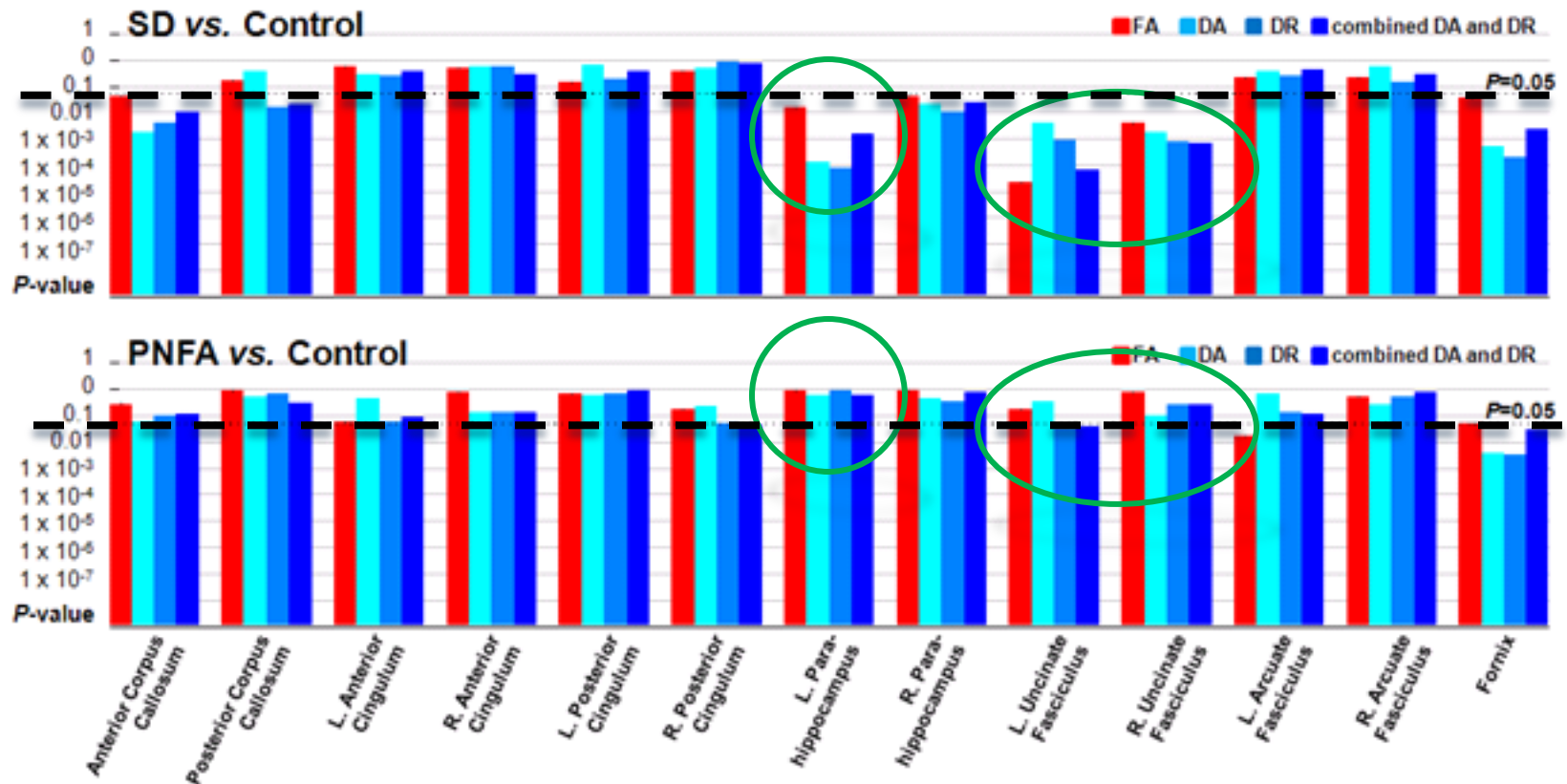


# Multivariate Analysis of DTI (with Yu)

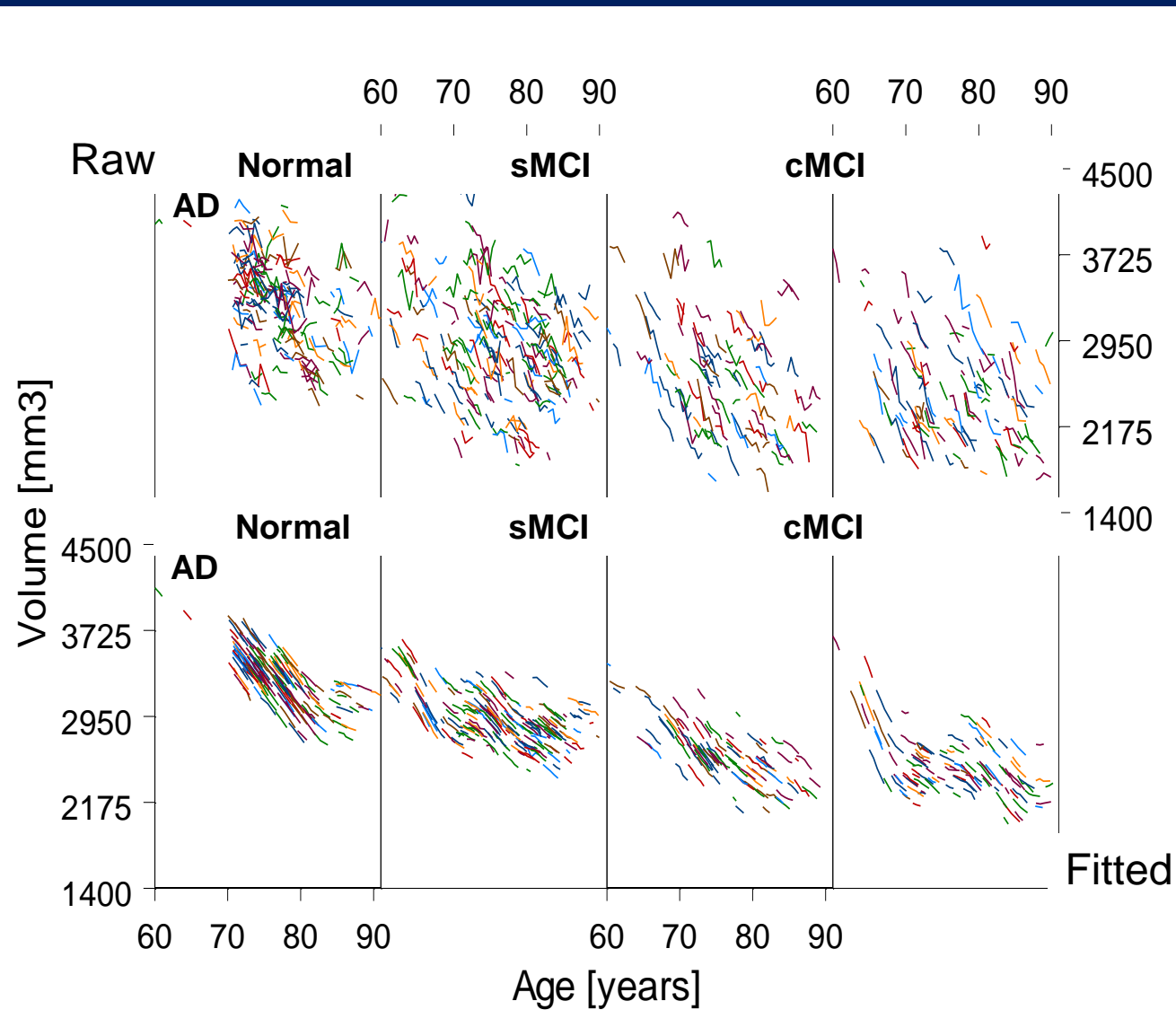
Comparison:

Separate and joint\* analyses of radial (DR) and axial (DA) diffusivity

Joint analysis by Hotelling T2

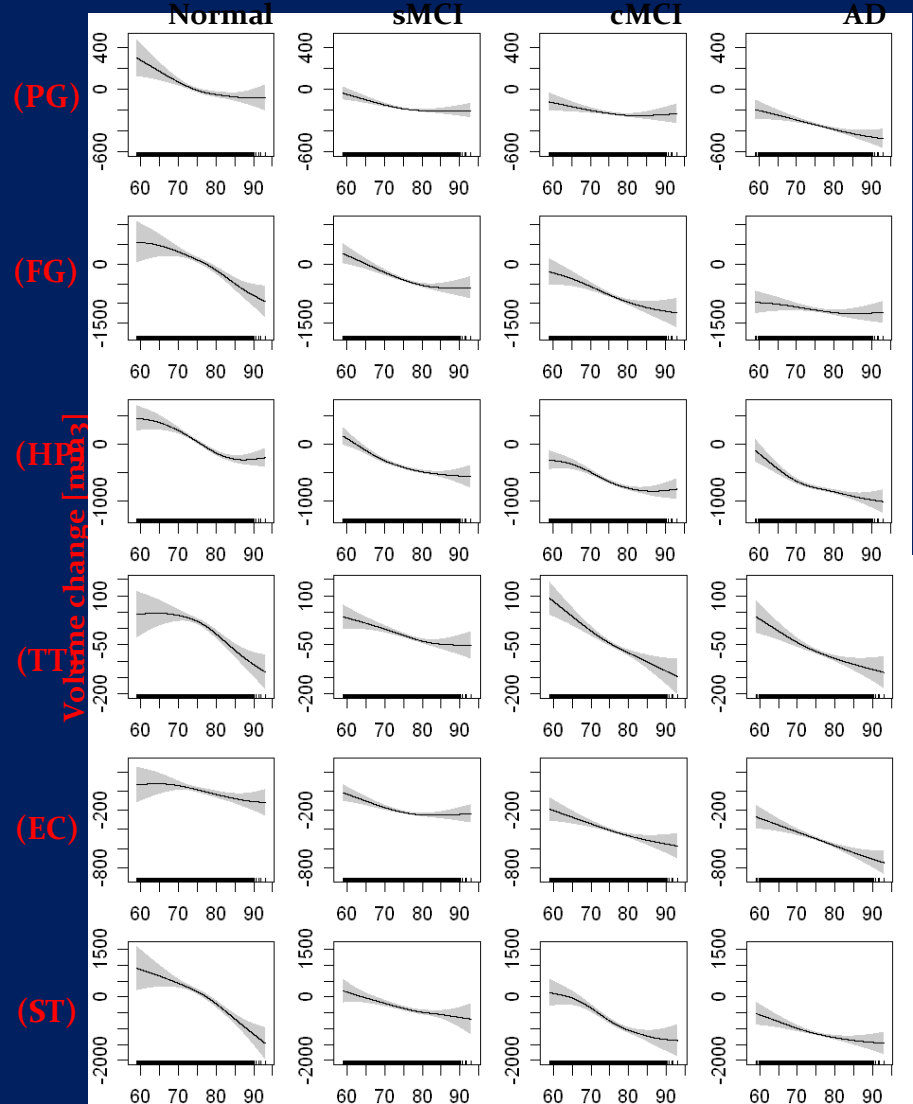
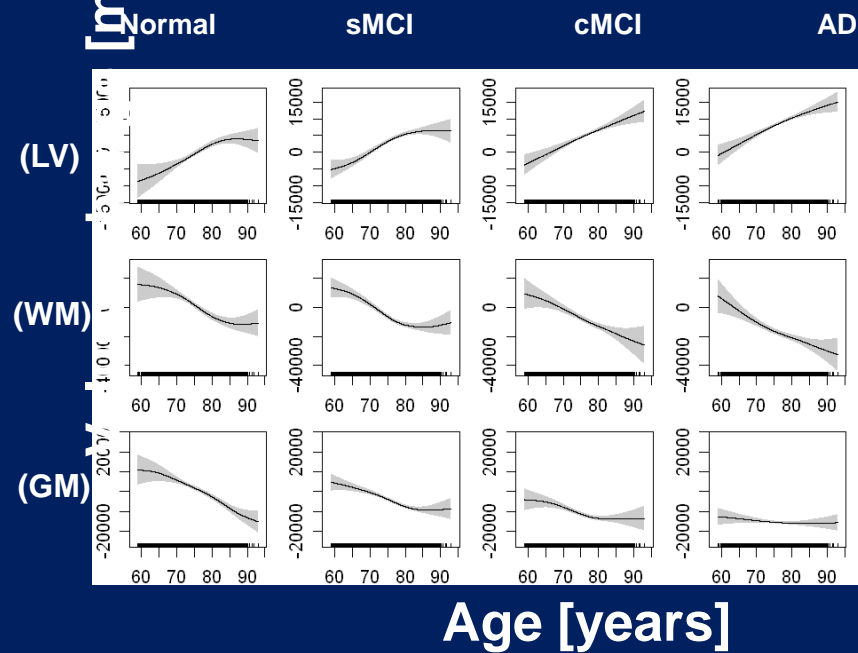


# Time Course of Brain Atrophy Using GAM



# Time Course of Brain Atrophy

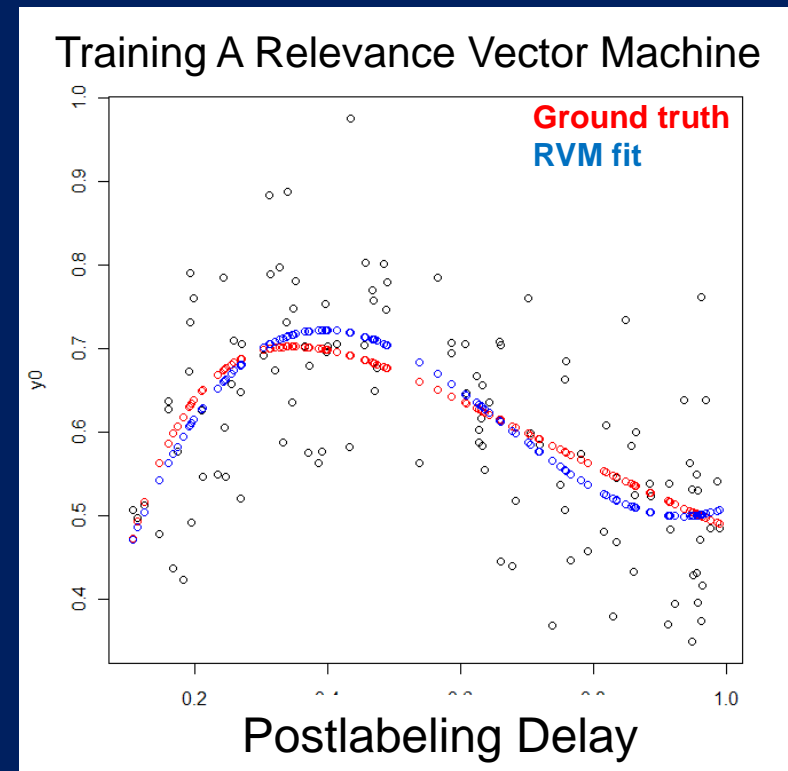
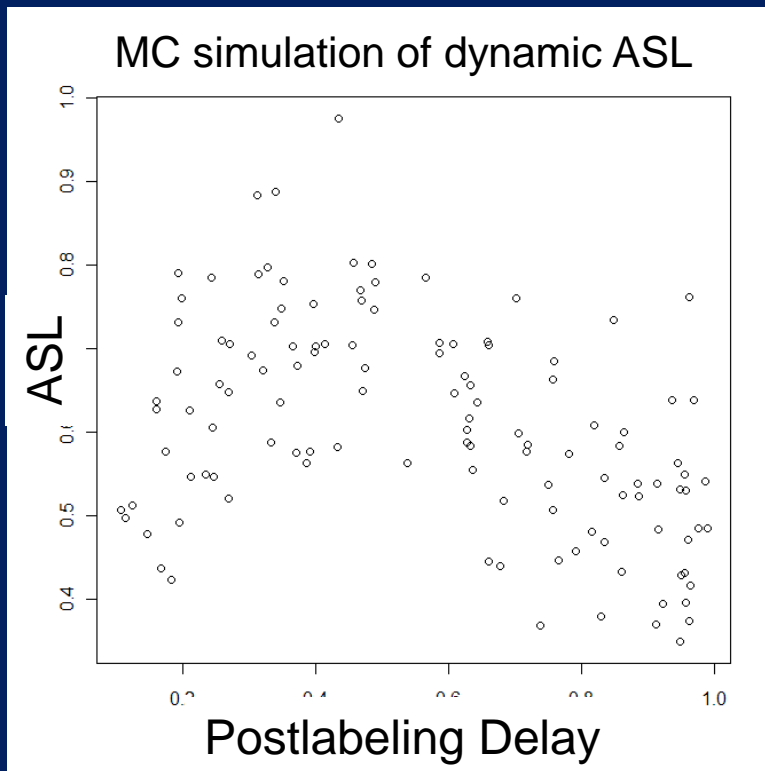
[mm<sup>3</sup>]



Age [years]

# Kernel Machine Methods For Nonlinear Fitting

Initial training of support vector machine and  
relevance vector machine algorithms



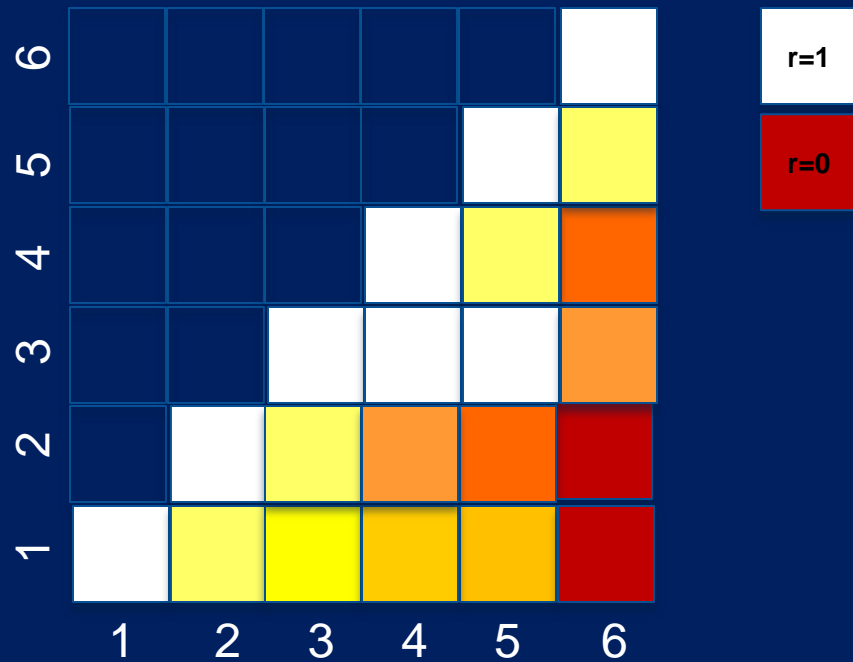
# Spatial Correlation Analysis Along Fiber Constructs

Motor  
Cortex

Brain  
stem



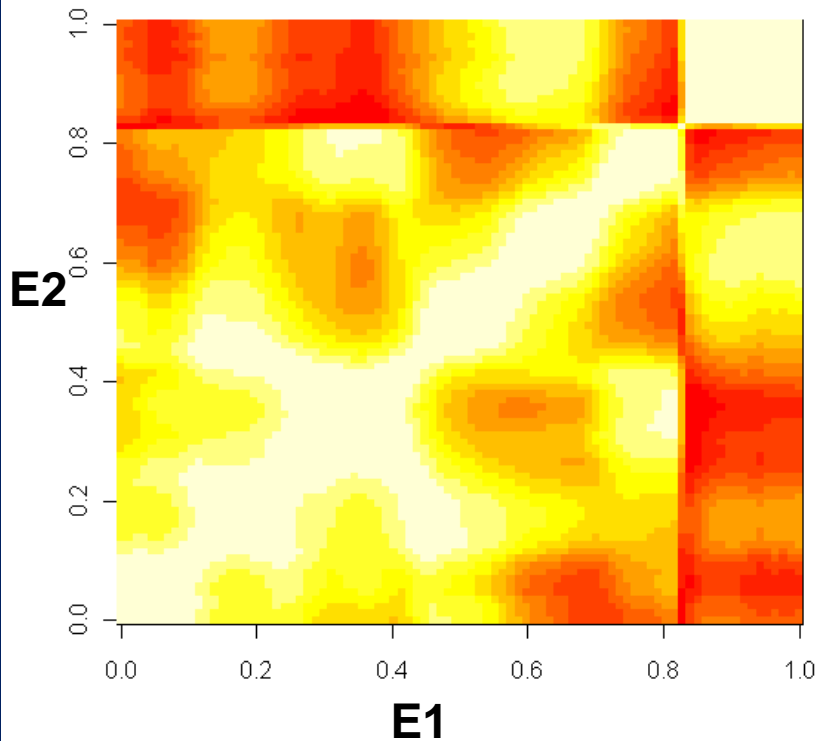
FA Spatial Correlation Matrix



# Spatial Correlation Graph

## Need To Develop Appropriate Statistic

**PD**



**Control**

